Whole-Body Diffusion Tensor Imaging: A Feasibility Study

Kenkel, David ; von Spiczak, Jochen ; Wurnig, Moritz C ; Filli, Lukas ; Steidle, Günter ; Wyss, Michael ; Boss, Andreas

Abstract: OBJECTIVE The aim of this study was to demonstrate the feasibility of whole-body diffusion tensor imaging (DTI) as a promising tool for research applications, for instance, for investigation of systemic muscle diseases. MATERIALS AND METHODS Twelve healthy volunteers (mean age, 26.6 years; range, 20-39 years) underwent whole-body magnetic resonance imaging at 3 T using an echo planar imaging sequence (b value, 400 s/mm) with 6 different spatial encoding directions. Coronal maps of DTI parameters including mean diffusivity, fractional anisotropy, and diffusion tensor eigenvalues (1-3) were generated using in-house MATLAB routines. Diffusion tensor imaging parameters were evaluated by region-of-interest analysis in skeletal muscle, cerebral gray and white matter, the kidneys, and the liver. RESULTS The acquisition time was 79 minutes 12 seconds. The different organs could be clearly depicted on the parametrical maps. Exemplary values in skeletal muscle were mean diffusivity, 1.67 ± 0.16 × 10 mm/s; fractional anisotropy, 0.26 ± 0.03; 1, 2.17 ± 0.20 × 10 mm/s; 2, 1.64 ± 0.17 × 10 mm/s; and 3, 1.22 ± 0.12 × 10 mm/s. CONCLUSION Whole-body DTI is technically feasible. Further refinements are required to achieve a higher signal-to-noise ratio and improved spatial resolution. A possible clinical application could be the assessment of systemic myopathies.

DOI: https://doi.org/10.1097/RCT.0000000000000324